U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-261 843

Saluda Lake, Greenville and Pickens Counties, South Carolina

National Eutrophication Survey, Corvallis, Oreg

Prepared for

Corvallis Environmental Research Lab, Oreg

May 76

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO.	2.	3. RECIPIENT'S ACCESSION NO.

4. TITLE AND SUBTITLE
Report on Saluda Lake, Greenville and Pickens Counties, South Carolina

5. REPORT DATE
Prepared May 1976

6. PERFORMING ORGANIZATION CODE

7. AUTHOR(S)
Anonymous (National Eutrophication Survey Staff)

8. PERFORMING ORGANIZATION REPORT NO.
Working Paper # 438

9. PERFORMING ORGANIZATION NAME AND ADDRESS
National Eutrophication Survey
U.S. Environmental Protection Agency
200 S. W. 35th St.
Corvallis, Oregon 97330

10. PROGRAM ELEMENT NO.

11. CONTRACT/GRANT NO.

12. SPONSORING AGENCY NAME AND ADDRESS
Office of Research and Development
U.S. Environmental Protection Agency
401 M Street, S. W.
Washington, DC 20460

13. TYPE OF REPORT AND PERIOD COVERED
Final - 1973

14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES
Prepared in cooperation with the U.S. Environmental Protection Agency, National Environmental Research Center, Las Vegas, Nevada 89114

16. ABSTRACT

Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
eutrophication lakes nutrients phosphorus nitrogen loading		05B 05C

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS *(This Report)*	21. NO. OF PAGES
Release unlimited		35
	20. SECURITY CLASS *(This page)*	22. PRICE
		4.00

EPA Form 2220-1 (9-73)

011024

PB 261 843

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL EUTROPHICATION SURVEY

WORKING PAPER SERIES

CORVALLIS ENVIRONMENTAL RESEARCH LABORATORY - CORVALLIS, OREGON

and

ENVIRONMENTAL MONITORING & SUPPORT LABORATORY - LAS VEGAS, NEVADA

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

.O. 699-440

REPORT
ON
SALUDA LAKE
GREENVILLE AND PICKENS COUNTIES
SOUTH CAROLINA
EPA REGION IV
WORKING PAPER No. 438

WITH THE COOPERATION OF THE
SOUTH CAROLINA DEPARTMENT OF HEALTH AND
ENVIRONMENTAL CONTROL
AND THE
SOUTH CAROLINA NATIONAL GUARD
MAY, 1976

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to freshwater lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's freshwater lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the South Carolina Department of Health and Environmental Control for professional involvement, to the South Carolina National Guard for conducting the tributary sampling phase of the Survey, and to those South Carolina wastewater treatment plant operators who voluntarily provided effluent samples and flow data.

The staff of the South Carolina Bureau of Wastewater and Stream Quality Control provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

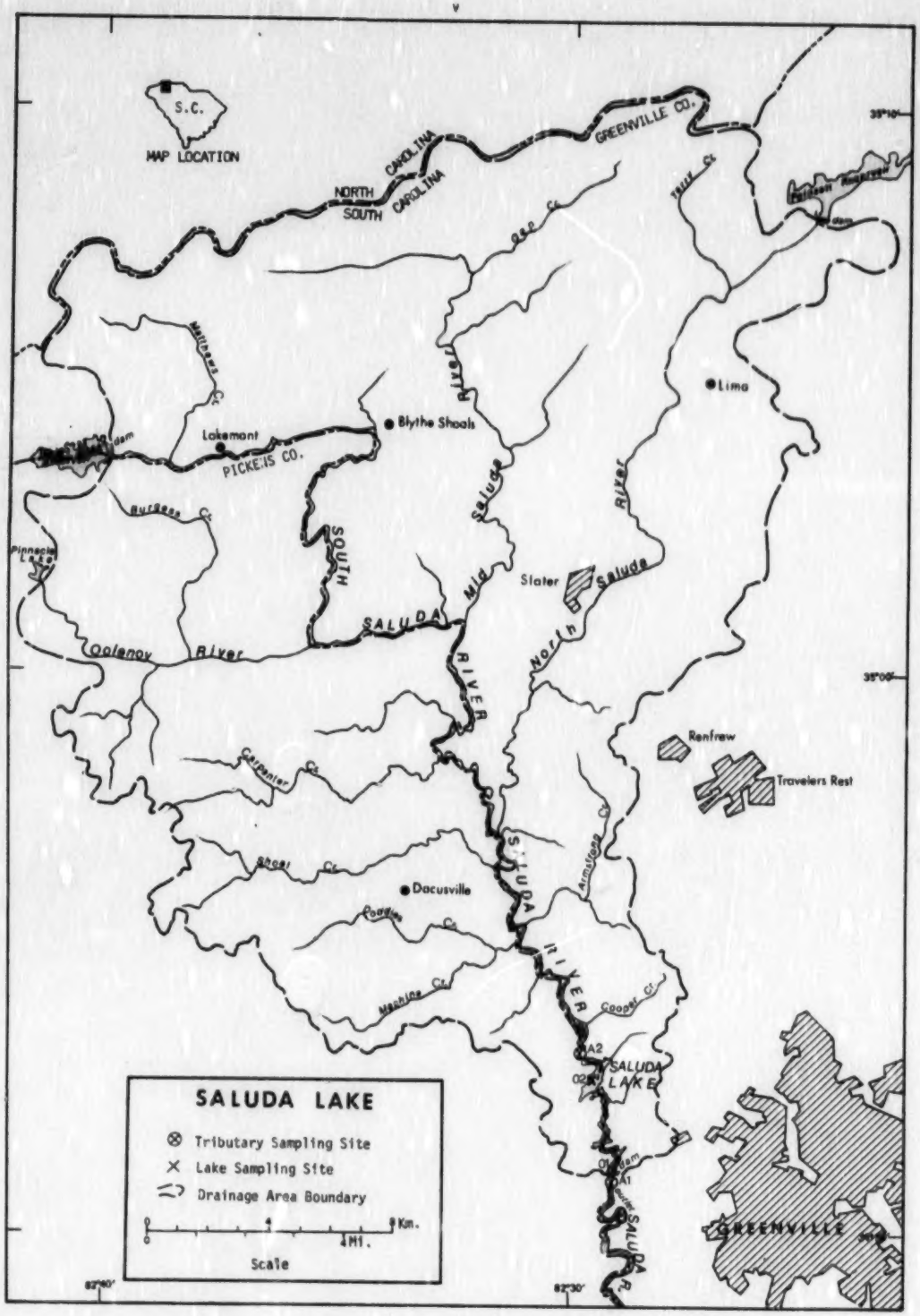
Major General Robert L. McCrady, the Adjutant General of South Carolina, and Project Officer Lt. Colonel John P. DuPre (Retired), who directed the volunteer efforts of the South Carolina National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF SOUTH CAROLINA

NAME	COUNTY
Clark Hill	Abbeville, McCormick, SC; Columbia, Elbert, Lincoln, McDuffie, Wilks, GA
Fishing Creek	Chester, Lancaster
Greenwood	Greenwood, Laurens, Newberry
Hartwell	Anderson, Oconee, Pickens, SC; Franklin, Hart, Stephens, GA
Keowee	Oconee, Pickens
Marion	Berkeley, Calhoun, Claredon, Orangeburg, Sumter
Moultrie	Berkeley
Murray	Lexington, Newberry, Richland, Saluda
Robinson	Chesterfield, Darlington
Saluda	Greenville, Pickens
Secession	Abbeville, Anderson
Wateree	Fairfield, Kershaw, Lancaster
William C. Bowen	Spartanburg
Wylie	York, SC; Gaston, Mecklenburg, NC


S.C.
MAP LOCATION
NORTH CAROLINA
SOUTH CAROLINA
GREENVILLE CO.
PICKENS CO.
Lake Jocassee
Jocassee Dam
Lake Keowee
Keowee Dam
Lake Hartwell
Hartwell Dam
Toxaway River
Whitewater Cr.
Lakemont
Blythe Shoals
Lima
Eastatoe Cr.
Thompson Cr.
Burgess Cr.
Pinnacle Lake
Oolenoy River
SOUTH SALUDA RIVER
Slater
Mid Saluda River
North Saluda River
Carpenter Cr.
Renfrew
Travelers Rest
Brushy Cr.
Docusville
Armstrong Cr.
Rocky Cr.
Machine Cr.
Cooper Cr.
SALUDA LAKE
A2
A1
Saluda Dam
GREENVILLE
SALUDA R.
35°10'
35°00'
82°40'
82°30'
SALUDA LAKE
Tributary Sampling Site
Lake Sampling Site
Drainage Area Boundary
0
4
8 Km.
4 Mi.
Scale

SALUDA LAKE

STORET NO. 4515

I. CONCLUSIONS

A. Trophic Condition:

Survey data indicate that Saluda Lake is mesotrophic. However, since the mean hydraulic retention time of this water body is a very short six days, it more closely resembles a slow-moving stream, and the term "moderately-enriched" may be a better description of this lake.

Saluda Lake ranked fourth in overall trophic quality when the 13 South Carolina lakes sampled in 1973 were compared using a combination of six parameters*. Seven of the lakes had less median total phosphorus, three had less and two had the same median dissolved phosphorus, three had less median inorganic nitrogen, 11 had greater mean Secchi disc transparency, but none of the other lakes had less mean chlorophyll a (1.5 µg/l). However, the low chlorophyll a concentrations and lack of transparency (the mean Secchi disc depth was less than 0.6 meters) indicate primary productivity was light-limited rather than nutrient limited. Survey limnologists commented on the highly turbid water at each of the sampling stations and times.

Survey limnologists observed floating and emergent macrophytes in the shallows near both sampling stations.

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* See Appendix A.

B. Rate-Limiting Nutrient:

The algal assay results indicate that Saluda Lake was phosphorus limited at the time the assay sample was collected (06/23/73). The lake data indicate phosphorus limitation at the other sampling times as well. However, primary productivity in the lake probably is light-limited rather than nutrient-limited.

C. Nutrient Controllability:

1. Point sources--No known point sources contributed phosphorus to Saluda Lake during the sampling year.

The present phosphorus loading of 15.23 $g/m^2/yr$ is five times that proposed by Vollenweider (Vollenweider and Dillon, 1974) as a eutrophic loading (page 11). However, the mean hydraulic retention time of Saluda Lake is a very short six days, and it is unlikely that Vollenweider's model is applicable.

2. Non-point sources--The phosphorus contributions of non-point sources accounted for the entire load impacting Saluda Lake during the year. The Saluda River contributed 99.6%, and the ungaged tributaries accounted for an estimated 0.3%.

The phosphorus export rate of the Saluda River (46 $kg/km^2/yr$) was rather high compared to the rates of the tributaries of downstream Lake Greenwood* (mean of 21 $kg/km^2/yr$; range of 9 to 36 $kg/km^2/yr$). The higher export rate may have been due to unmeasured sources impacting one or more of the three branches of the Saluda River above the lake; e.g., septic tanks in Slater (see map, page v).

* Working Paper No. 431.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS†

A. Lake Morphometry††:

1. Surface area: 2.25 kilometers^2.
2. Mean depth: 4.0 meters.
3. Maximum depth: 12.2 meters.
4. Volume: 9.000×10^6 m^3.
5. Mean hydraulic retention time: 6 days.

B. Tributary and Outlet:
(See Appendix C for flow data)

1. Tributaries -

Name	Drainage area (km^2)*	Mean flow (m^3/sec)*
Saluda River	738.1	17.56
Minor tributaries & immediate drainage -	13.4	0.12
Totals	751.5	17.68

2. Outlet -

Saluda River	753.7**	17.68

C. Precipitation***:

1. Year of sampling: 141.0 centimeters.
2. Mean annual: 124.5 centimeters.

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† Table of metric conversions--Appendix B.
†† Mast, 1974.
* For limits of accuracy, see Working Paper No. 175, "...Survey Methods, 1973-1976".
** Includes area of lake.
*** See Working Paper No. 175.

III. LAKE WATER QUALITY SUMMARY

Saluda Lake was sampled three times during the open-water season of 1973 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from a number of depths at two stations on the lake (see map, page v). During each visit, a single depth-integrated (4.6 m or near bottom to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the first visit, a single 18.9-liter depth-integrated sample was composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 9.1 meters at station 1 and 4.3 meters at station 2.

The sampling results are presented in full in Appendix D and are summarized in the following table.

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR SALUDA LAKE
STORET CODE 4515

PARAMETER	1ST SAMPLING (6/23/73) 2 SITES RANGE	MEAN	MEDIAN	2ND SAMPLING (9/18/73) 2 SITES RANGE	MEAN	MEDIAN	3RD SAMPLING (11/14/73) 2 SITES RANGE	MEAN	MEDIAN
TEMP (C)	21.7 - 23.2	22.2	22.1	20.7 - 21.6	21.2	21.3	8.0 - 10.2	8.9	8.7
DISS OXY (MG/L)	7.0 - 8.7	7.7	7.6	4.2 - 7.4	6.1	6.2	9.0 - 10.8	10.2	10.4
CNDCTVY (MCROMO)	50. - 50.	50.	50.	25. - 30.	27.	26.	25. - 29.	27.	27.
PH (STAND UNITS)	7.1 - 7.6	7.2	7.2	6.2 - 6.8	6.3	6.2	6.4 - 6.8	6.6	6.5
TOT ALK (MG/L)	13. - 14.	13.	13.	11. - 15.	13.	13.	13. - 16.	15.	15.
TOT P (MG/L)	0.046 - 0.074	0.059	0.060	0.031 - 0.193	0.059	0.033	0.039 - 0.065	0.048	0.042
ORTHO P (MG/L)	0.003 - 0.011	0.005	0.005	0.006 - 0.008	0.007	0.007	0.006 - 0.009	0.007	0.007
NO2+NO3 (MG/L)	0.160 - 0.200	0.183	0.180	0.090 - 0.180	0.140	0.140	0.090 - 0.130	0.105	0.100
AMMONIA (MG/L)	0.070 - 0.120	0.097	0.100	0.060 - 0.170	0.090	0.080	0.060 - 0.120	0.077	0.070
KJEL N (MG/L)	0.200 - 0.200	0.200	0.200	0.300 - 0.780	0.467	0.450	0.200 - 0.300	0.233	0.200
INORG N (MG/L)	0.260 - 0.320	0.280	0.280	0.150 - 0.310	0.230	0.230	0.160 - 0.210	0.182	0.175
TOTAL N (MG/L)	0.360 - 0.400	0.383	0.380	0.450 - 0.790	0.607	0.590	0.300 - 0.400	0.338	0.320
CHLRPYL A (UG/L)	1.7 - 2.4	2.0	2.0	1.2 - 1.5	1.3	1.3	0.7 - 1.6	1.1	1.1
SECCHI (METERS)	0.4 - 0.5	0.5	0.5	0.5 - 0.9	0.7	0.7	0.6 - 0.6	0.6	0.6

B. Biological Characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal Units per ml
06/23/73	1. Flagellates	265
	2. Pennate diatoms	35
	3. Navicula sp.	35
	4. Achnanthes sp.	18
	5. Oscillatoria sp.	18
	Other genera	52
	Total	423
09/18/73	1. Flagellates	62
	2. Asterionella sp.	49
	3. Attheya sp.	37
	4. Cyclotella sp.	12
	5. Merismopedia sp.	12
	Other genera	11
	Total	183
11/14/73	1. Melosira sp.	29
	2. Nitzschia sp.	24
	3. Flagellates	24
	4. Anabaena sp.	16
	5. Synedra sp.	12
	Other genera	64
	Total	169

2. Chlorophyll a -

Sampling Date	Station Number	Chlorophyll a (µg/l)
06/23/73	1	2.4
	2	1.7
09/18/73	1	1.2
	2	1.5
11/14/73	1	0.7
	2	1.6

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.008	0.182	0.2
0.010 P	0.018	0.182	3.1
0.020 P	0.028	0.182	6.0
0.050 P	0.058	0.182	7.1
0.025 P + 0.5 N	0.033	0.682	7.3
0.050 P + 1.0 N	0.058	1.182	17.1
1.0 N	0.008	1.182	0.1

2. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, indicates that the potential primary productivity of Saluda Lake was moderate at the time the sample was collected. Also, increasing yields with increasing concentrations of orthophosphorus indicate that the lake was limited by phosphorus at that time. Note that the addition of only nitrogen resulted in a yield not significantly different from that of the control.

The lake data also indicate phosphorus limitation. At both stations and all sampling times, the mean inorganic nitrogen/orthophosphorus ratios were 23/1 or greater, and phosphorus limitation would be expected. However, primary productivity in the lake probably is light-limited rather than nutrient-limited.

IV. NUTRIENT LOADINGS
(See Appendix E for data)

For the determination of nutrient loadings, the South Carolina National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff month of January when two samples were collected. Sampling was begun in February, 1973, and was completed in February, 1974.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the South Carolina District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loads for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the means of the nutrient loads, in $kg/km^2/year$, at stations B-1 and C-1 of Lake William C. Bowen** and multiplying the means by the ZZ area in km^2.

No known point sources impacted Saluda Lake during the sampling year.

A. Waste Sources:

1. Known municipal - None
2. Known industrial - None

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* See Working Paper No. 175.
** Working Paper No. 429.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/ yr	% of total
a. Tributaries (non-point load) -		
Saluda River	34,150	99.6
b. Minor tributaries & immediate drainage (non-point load) -	85	0.3
c. Known municipal STP's - None	-	-
d. Septic tanks - Unknown	?	-
e. Known industrial - None	-	-
f. Direct precipitation* -	40	0.1
Total	34,275	100.0

2. Outputs -

Lake outlet - Saluda River 20,440

3. Net annual P accumulation - 13,835 kg.

* See Working Paper No. 175.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	kg N/yr	% of total
a. Tributaries (non-point load) -		
Saluda River	428,815	98.8
b. Minor tributaries & immediate drainage (non-point load) -	2,675	0.6
c. Known municipal STP's - None	-	-
d. Septic tanks - Unknown	?	-
e. Known industrial - None	-	-
f. Direct precipitation* -	2,430	0.6
Total	433,920	100.0

2. Outputs -

Lake outlet - Saluda River 243,020

3. Net annual N accumulation - 190,900 kg.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	kg P/km^2/yr	kg N/km^2/yr
Saluda River	46	581

* See Working Paper No. 175.

E. Yearly Loads:

In the following table, the existing phosphorus loadings are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Essentially, his "dangerous" loading is one at which the receiving water would become eutrophic or remain eutrophic; his "permissible" loading is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic loading would be considered one between "dangerous" and "permissible".

Note that Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

	Total Phosphorus		Total Nitrogen	
	Total	Accumulated	Total	Accumulated
grams/m^2/yr	15.23	6.15	192.9	84.8

Vollenweider phosphorus loadings ($g/m^2/yr$) based on mean depth and mean hydraulic retention time of Saluda Lake:

"Dangerous" (eutrophic loading)	3.00
"Permissible" (oligotrophic loading)	1.50

V. LITERATURE REVIEWED

Mast, G. Nelson, 1974. Personal communication (lake morphometry). SC Dept. of Health & Env. Contr., Columbia.

Vollenweider, R. A., and P. J. Dillon, 1974. The application of the phosphorus loading concept to eutrophication research. Natl. Res. Council of Canada Publ. No. 13690, Canada Centre for Inland Waters, Burlington, Ontario.

VI. APPENDICES

APPENDIX A

LAKE RANKINGS

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DC	MEDIAN DISS ORTHO P
4503	FISHING CREEK RESERVOIR	0.143	0.535	483.000	2.811	10.200	0.051
4504	LAKE GREENWOOD	0.061	0.470	463.917	8.150	15.000	0.011
4505	LAKE HARTWELL	0.013	0.130	422.000	6.157	15.000	0.004
4506	LAKE MARION	0.055	0.280	470.176	8.728	14.900	0.010
4507	LAKE MURRAY	0.024	0.260	424.905	6.408	15.000	0.007
4508	LAKE ROBINSON	0.014	0.260	458.778	8.611	14.000	0.005
4510	LAKE WATEREE	0.094	0.450	475.667	8.408	14.100	0.034
4511	LAKE WYLIE	0.045	0.380	462.222	5.422	14.800	0.013
4512	LAKE MOULTRIE	0.026	0.200	455.36	8.800	11.200	0.006
4513	LAKE KEOWEE	0.008	0.170	371.750	2.633	15.000	0.003
4514	LAKE SECESSION	0.057	0.355	462.778	10.722	15.000	0.006
4515	SALUDA LAKE	0.046	0.230	476.833	1.517	10.800	0.006
4516	LAKE WILLIAM C. BOWEN	0.022	0.360	459.889	3.911	15.000	0.007

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P	INDEX NO
4503	FISHING CREEK RESERVOIR	0 (0)	0 (0)	0 (0)	92 (11)	100 (12)	0 (0)	192
4504	LAKE GREENWOOD	17 (2)	8 (1)	33 (4)	42 (5)	21 (0)	25 (3)	146
4505	LAKE HARTWELL	92 (11)	100 (12)	92 (11)	58 (7)	21 (0)	92 (11)	455
4506	LAKE MARION	33 (4)	50 (6)	25 (3)	17 (2)	50 (6)	33 (4)	208
4507	LAKE MURRAY	67 (8)	62 (7)	83 (10)	50 (6)	21 (0)	46 (5)	329
4508	LAKE ROBINSON	83 (10)	62 (7)	67 (8)	25 (3)	75 (9)	83 (10)	395
4510	LAKE WATEREE	8 (1)	17 (2)	17 (2)	33 (4)	67 (8)	8 (1)	150
4511	LAKE WYLIE	50 (6)	25 (3)	50 (6)	67 (8)	58 (7)	17 (2)	267
4512	LAKE MOULTRIE	58 (7)	83 (10)	75 (9)	8 (1)	83 (10)	71 (8)	378
4513	LAKE KEOWEE	100 (12)	92 (11)	100 (12)	83 (10)	21 (0)	100 (12)	496
4514	LAKE SECESSION	25 (3)	42 (5)	42 (5)	0 (0)	21 (0)	58 (7)	188
4515	SALUDA LAKE	42 (5)	75 (9)	8 (1)	100 (12)	92 (11)	71 (8)	388
4516	LAKE WILLIAM C. BOWEN	75 (9)	33 (4)	58 (7)	75 (9)	21 (0)	46 (5)	308

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
1	4513	LAKE KEOWEE	496
2	4505	LAKE HARTWELL	455
3	4508	LAKE ROBINSON	395
4	4515	SALUDA LAKE	388
5	4512	LAKE MOULTRIE	378
6	4507	LAKE MURRAY	329
7	4516	LAKE WILLIAM C. BOWEN	308
8	4511	LAKE WYLIE	267
9	4506	LAKE MARION	208
10	4503	FISHING CREEK RESERVOIR	192
11	4514	LAKE SECESSION	188
12	4510	LAKE WATEREE	150
13	4504	LAKE GREENWOOD	146

APPENDIX B

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX C

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR SOUTH CAROLINA 04/27/76

LAKE CODE 4515 SALUDA LAKE

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 753.7

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
4515A1	753.7	19.96	23.79	26.48	25.91	19.54	16.28	14.58	12.18	11.47	12.88	13.03	16.57	17.68
4515A2	738.1	20.25	24.07	26.48	26.05	19.26	15.86	14.30	11.89	11.19	12.60	12.74	16.57	17.56
4515ZZ	14.2	0.142	0.170	0.170	0.142	0.113	0.113	0.085	0.085	0.057	0.085	0.113	0.142	0.118

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 753.7
SUM OF SUB-DRAINAGE AREAS = 752.4

TOTAL FLOW IN = 212.66
TOTAL FLOW OUT = 212.66

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
4515A1	2	73	31.715	11	23.078				
	3	73	39.077	11	29.450				
	4	73	43.325	16	33.414				
	5	73	42.475	5	28.034				
	6	73	30.016	12	29.166				
	7	73	20.615	13	15.999				
	8	73	14.696	12	14.866				
	9	73	9.996	16	10.194				
	10	73	10.619	14	8.353				
	11	73	10.477	19	11.327				
	12	73	25.768	19	12.035				
	1	74	36.812	14	25.910	28	44.174		
	2	74	35.113	4	43.042				
4515A2	2	73	31.432	11	25.485				
	3	73	38.794	11	36.812				
	4	73	43.042	16	33.697				
	5	73	42.192	5	28.317				
	6	73	29.733	12	31.149				
	7	73	20.247	13	16.990				
	8	73	14.158	12	14.725				
	9	73	9.628	16	9.628				
	10	73	10.194	14	10.194				
	11	73	10.194	19	10.760				
	12	73	25.485	19	12.176				
	1	74	37.378	14	25.485	28	43.891		
	2	74	34.830	4	42.758				

TRIBUTARY FLOW INFORMATION FOR SOUTH CAROLINA 04/27/76

LAKE CODE 4515 SALUDA LAKE

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
451522	2	73	0.198	11	0.170				
	3	73	0.198	11	0.198				
	4	73	0.227	16	0.170				
	5	73	0.198	5	0.142				
	6	73	0.170	12	0.198				
	7	73	0.113	13	0.113				
	8	73	0.113	12	0.085				
	9	73	0.085	16	0.057				
	10	73	0.085	14	0.057				
	11	73	0.085	19	0.085				
	12	73	0.142	19	0.113				
	1	74	0.170	14	0.142	28	0.283		
	2	74	0.142	4	0.142				

APPENDIX D

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 76/04/27

451501
34 51 10.0 082 29 03.0 3
SALUDA LAKE
45045 SOUTH CAROLINA

030891

11EPALES 2111202
0033 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/06/23	10 05	0000	23.2		21	50K	7.60	13	0.110	0.200	0.160	0.004
	10 05	0005	22.5	8.7		50K	7.30	14	0.080	0.200K	0.180	0.003
	10 05	0015	22.3	7.2		50K	7.20	14	0.070	0.200K	0.190	0.003
	10 05	0030	22.0	7.0		50K	7.20	13	0.120	0.200K	0.200	0.005
73/09/18	15 45	0000	21.6	7.0	35	25	6.30	14	0.060	0.700	0.090	0.006
	15 45	0010	21.4	6.2		26	6.20	12	0.080	0.300	0.150	0.006
	15 45	0020	21.2	5.6		25	6.20	13	0.090	0.400	0.140	0.007
	15 45	0030	20.7	4.2		30	6.20	15	0.170	0.500	0.140	0.007
73/11/14	08 38	0000	10.2		24	27	6.80	15	0.120	0.300	0.090	0.007
	08 38	0005	9.6	9.0		26	6.60	13	0.060	0.200K	0.100	0.007
	08 38	0015	8.7	10.4		26	6.40	16	0.060	0.200K	0.110	0.008
	08 38	0029	8.2	10.0		25	6.50	16	0.080	0.200	0.100	0.009

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/06/23	10 05	0000	0.046	2.4
	10 05	0005	0.046	
	10 05	0015	0.055	
	10 05	0030	0.060	
73/09/18	15 45	0000	0.032	1.2
	15 45	0010	0.032	
	15 45	0020	0.035	
	15 45	0030	0.031	
73/11/14	08 38	0000	0.039	0.7
	08 38	0005	0.041	
	08 38	0015	0.039	
	08 38	0029	0.065	

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/04/27

451502
34 52 50.0 082 29 29.0 3
SALUDA LAKE
45045 SOUTH CAROLINA
030891

11EPALES 2111202
0016 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/06/23	10 45	0000	22.1		16	50K	7.20	13	0.110	0.200	0.170	0.006
	10 45	0005	21.9	7.6		50K	7.10	13	0.100	0.200K	0.180	0.005
	10 45	0014	21.7	7.8		50K	7.10	14	0.090	0.200K	0.200	0.011
73/09/18	16 20	0000	21.6	7.4	19	26	6.80	12	0.060	0.600	0.140	0.007
	16 20	0013	20.9			27	6.30	11	0.080	0.300	0.180	0.008
73/11/14	09 00	0000	8.7		24	29	6.60	15	0.060	0.300	0.100	0.006
	09 00	0001	8.7	10.6		29						
	09 00	0007	8.0	10.8		27	6.50	15	0.080	0.200	0.130	0.006

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/06/23	10 45	0000	0.064	1.7
	10 45	0005	0.070	
	10 45	0014	0.074	
73/09/18	16 20	0000	0.034	1.5
	16 20	0013	0.193	
73/11/14	09 00	0000	0.043	1.6
	09 00	0007	0.059	

K VALUE KNOWN TO BE
LESS THAN INDICATED

APPENDIX E

TRIBUTARY DATA

STORET RETRIEVAL DATE 76/04/27

4515A1
34 51 00.0 082 29 00.0 4
SALUDA RIVER
45 GREENVILLE CO HW
O/SALUDA LAKE 030891
RD BRDG 2 MI W OF WESTVILLE
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/02/11	13 40		0.168	0.100K	0.031	0.009	0.035
73/03/11	11 00		0.132	0.170	0.026	0.009	0.040
73/04/16	15 30		0.132	0.735	0.073	0.005K	0.025
73/05/05	10 30		0.100	0.100K	0.015	0.010	0.025
73/06/12	14 15		0.110	0.460	0.031	0.009	0.035
73/07/13	09 40		0.120	0.100K	0.027	0.006	0.030
73/08/12	12 30		0.115	0.230	0.046	0.011	0.040
73/09/16	10 30		0.130	0.350	0.044	0.008	0.045
73/10/14	09 10		0.087	0.200	0.076	0.008	0.055
73/11/19	12 22		0.100	0.650	0.060	0.012	0.050
74/01/14	15 05		0.132	0.600	0.060	0.008	0.025
74/01/28	16 10		0.136	0.300	0.024	0.008	0.055
74/02/04	16 20		0.184	0.100K	0.030	0.010	0.025

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/04/27

4515A2
34 54 00.0 082 30 00.0 4
SALUDA RIVER
45 GREENVILLE CO HW
1/SALUDA LAKE 031392
ST HWY 183 BRDG 2 MI W JCT WITH HWY 250
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/02/11	14 10		0.160	0.130	0.028	0.005	0.035
73/03/11	11 35		0.147	0.250	0.018	0.006	0.050
73/04/16	16 00		0.126	1.260	0.058	0.005K	0.040
73/05/05	11 00		0.105	0.170	0.038	0.010	0.040
73/06/12	14 40		0.138	2.940	0.132	0.011	0.055
73/07/13	09 55		0.150	0.210	0.030	0.009	0.045
73/08/12	13 00		0.147	0.120	0.018	0.009	0.045
73/09/16	11 00		0.115	0.190	0.033	0.010	0.045
73/10/14	09 45		0.105	0.850	0.060	0.011	0.045
73/11/19	14 05		0.076	0.650	0.048	0.010	0.020
74/01/14	15 30		0.136	0.200	0.032	0.008	0.085
74/01/28	16 45		0.132	0.700	0.068	0.008	0.140
74/02/04	15 30		0.184	0.800	0.060	0.010	0.170

K VALUE KNOWN TO BE
LESS THAN INDICATED